
UNIVERSITI SAINS MALAYSIA

Peperiksaan Kursus Semester Cuti Panjang
Sidang Akademik 2002/2003

April 2003

IUK 291 – MATEMATIK II

Masa : 3 jam

Sila pastikan bahawa kertas peperiksaan ini mengandungi LIMA mukasurat yang bercetak sebelum anda memulakan peperiksaan ini.

Jawab EMPAT (4) soalan. Semua soalan mesti dijawab dalam Bahasa Malaysia.

1. (a) Describe the domain of the function

$$f(x, y) = \ln(x + y)$$

(30 marks)

- (b) Show that

$$(x, y) \xrightarrow{\lim} (0, 0) \frac{xy}{x^2 + y^2}$$

does not exist

(30 marks)

- (c) Show that

$$f(x, y) = \frac{x^2 y^2}{(x + y)} \text{ Satisfies the equation}$$

$$x \frac{\partial f}{\partial x} + y \frac{\partial f}{\partial y} = 3f$$

(40 marks)

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1. (a) *Terangkan domain bagi fungsi*

$$f(x, y) = \ln(x + y)$$

(30 markah)

- (b) *Tunjukkan bahawa*

$$(x, y) \xrightarrow{\lim} (0, 0) \frac{xy}{x^2 + y^2}$$

tidak wujud

(30 markah)

(c) *Tunjukkan bahawa*

$$f(x, y) = \frac{x^2 y^2}{(x + y)} \text{ mematuhi persamaan}$$

$$x \frac{\partial f}{\partial x} + y \frac{\partial f}{\partial y} = 3f$$

(40 markah)

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2. (a) The temperature at point (x, y, z) on the sphere $x^2 + y^2 + z^2 = 4$ is
 $T(x, y, z) = xy^2z$.
Find the absolute maximum temperature and the points at which it occurs.

(60 marks)

- (b) The volume V of a right-circular cylinder is given by $V = \pi r^2 h$, where r is the radius and h is the height.
Find a formula for the instantaneous rate of change of V with respect to r if h remains constant.

(40 marks)

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2. (a) *Suhu pada titik (x, y, z) di atas sfera $x^2 + y^2 + z^2 = 4$ ialah*
 $T(x, y, z) = xy^2z$.
Cari suhu maksimum mutlak dan titik-titik kedudukannya..

(60 markah)

- (b) *Isipadu V silinder bulat-tepat ialah $V = \pi r^2 h$, r ialah jejari dan h tingginya.*
Cari suatu formula untuk kadar perubahan serta merta V berkaitan dengan r jika h tetap.

(40 markah)

[IUK 291]

3. (a) Find

$$\int_{-\pi/2}^{\pi/2} \int_{1-y^2}^2 x \cos y \, dx dy$$

(20 marks)

(b) Find

$$\int_0^1 \int_0^{1-x} \int_0^{1-x-y} x^2 \, dz dy dx$$

(40 marks)

(c) Find the radius of convergence and the interval of convergence

$$\sum_{k=0}^{\infty} \frac{X^k}{k+1}$$

(40 marks)

3. (a) Cari

$$\int_{-\pi/2}^{\pi/2} \int_{1-y^2}^2 x \cos y \, dx dy$$

(20 markah)

(b) Cari

$$\int_0^1 \int_0^{1-x} \int_0^{1-x-y} x^2 \, dz dy dx$$

(40 markah)

(c) Kira jejari penumpuan dan jeda penumpuan

$$\sum_{k=0}^{\infty} \frac{X^k}{k+1}$$

(40 markah)

4. (a) Find the general solution of

$$y'' + y' + y = 0$$

(50 marks)

- (b) Find the Fourier series expansion for the function

$$\begin{cases} 0, & -\pi < x < 0 \\ \sin x, & 0 \leq x \leq \pi \end{cases}$$

and hence deduce a series for π .

(50 marks)

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4. (a) Cari penyelesaian am bagi

$$y'' + y' + y = 0$$

(50 markah)

- (b) Cari kembangan siri Fourier bagi fungsi

$$\begin{cases} 0, & -\pi < x < 0 \\ \sin x, & 0 \leq x \leq \pi \end{cases}$$

kemudian dapatkan suatu siri bagi π .

(50 markah)